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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/848,773	05/03/2001	Qian Chen	06666/076001/USC-2892	6630
20985	7590	09/06/2006	EXAMINER	
FISH & RICHARDSON, PC P.O. BOX 1022 MINNEAPOLIS, MN 55440-1022			NGUYEN, KIMBINH T	
			ART UNIT	PAPER NUMBER
			2628	
DATE MAILED: 09/06/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/848,773	Applicant(s) CHEN ET AL.	
	Examiner Kimbinh T. Nguyen	Art Unit 2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 13-24,29,31-39,44,46-49,55 and 57-77 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 29,31-39,55 and 57-63 is/are allowed.
- 6) ☒ Claim(s) 13-24,44,46-49,64-77 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 04/25/06 has been entered.

Drawings

2. The drawings were received on 04/25/06. These drawings are Fig 1-Fig. 5.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 64 is rejected under 35 U.S.C. 103(a) as being unpatentable over Woodfill et al. (6,456,737) in view of Hartley et al. "Stereo from Uncalibrated Cameras".

Claim 64, Woodfill et al. discloses obtaining two images of similar image information from two sources (col. 10, line 16, col. 11, lines 37-41; col. 13, lines 4-5); rectify input image (col. 16, lines 25-29); using the rectified images to form 3D by forming a disparity map of 3D information for matching pixels (a final disparity image

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290; col. 16, line 26 through col. 18, line 9). Woodfill teaches obtaining two images of similar image information from two sources as discussed above and does not show clearly from two uncalibrated sources; however, Hartley teaches obtaining stereo from uncalibrated cameras (sections 1, 1.3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the stereo from uncalibrated cameras taught by Hartley into the method of rectified images and the disparity map of Woodfill, because it would avoid the explicit computation of internal or external camera parameter model (section 1.3).

5. Claims 13, 65-75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodfill et al. (6,456,737) in view of Hartley et al. "Stereo from Uncalibrated Cameras" and further in view of Ayache et al. (6,175,648).

Claims 65-67, 72-75 and 13, Ayache et al. teaches disparity map indicating an estimate of 3D surface and information of the estimate (col. 2, lines 40-44; col. 4, lines 12-17); manually establishing matching parts (col. 4, lines 32-34, lines 47-49); identifying parts in the image (col. 8, lines 40-44), using automatically rectified images to form 3D information (col. 5, lines 3-14); forming a disparity surface indicative of 3D information of the image (col. 8, lines 65-67); a difference between coordinates of matching pixels (col. 9, lines 8-10); a variable denoting a degree of similarity between pixels (col. 8, lines 55-58), a variable of error in 3D surface (a degree of disparity which is inconsistent with the disparities on all the other curves; col. 9, lines 6-7).

Claims 68-70, Ayache et al. discloses defining images in terms of epipolar geometry (epipolar lines; col. 5, lines 7-9), aligning the images in the epipolar geometry

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(epipolar lines are parallel and coincident with the image lines or column; col. 5, lines 6-9); aligning specified reference lines which include lines passing through manually-obtained image parts (fig. 6).

Claim 71, Ayache et al. discloses finding an average of end points of two different reference lines, forming a line through an averaged part (the Euclidian distance in a plane between points in a pair of images 1 and 2; fig. 6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate method of calibrating, matching between images taught by Ayache into the method of rectified images and the disparity map of Woodfill, because it would provide an estimate of the parameters of the models and define the relationship between the coordinates of a 3D point in the scene and the 2D coordinates of its projection into the image plane (col. 4, lines 12-16).

6. Claims 44, 46, 47, 76 and 77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ayache et al. (6,175,648) in view of Hartley et al. "Stereo from Uncalibrated Cameras".

Claim 44, Ayache teaches an image from two uncalibrated cameras to obtain 3D information (producing cartographic data in 3D from n two-dimensional images of the scene; col. 2, lines 35-38); rectifying the image to form coplanar images with scan lines are horizontally parallel (col. 5, lines 4-14); identifying points, scan lines which pass through the points forming horizontally parallel scan lines (epipolar lines; col. 5, line 1 through col. 6, line 15); disparity map (col. 7, lines 18-30). Ayache teaches the images are delivered by a respective detectors seeing the scene from different points of view

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(abstract) and does not show clearly uncalibrated cameras; however, Hartley teaches this feature (see abstract; sections 1, 1.3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the stereo images taken by an uncalibrated camera as taught by Hartley into the Ayache's method, because it would avoid the explicit computation of internal or external camera parameter model (section 1.3).

Claim 46, the rationale provided in the rejection of claim 44 is incorporated herein. In addition, Ayache et al. teaches using information from the rectified images to form third dimension information associated with each of the 2D points of the image (using the first and second images with the aligned lines (the rectified images 1 and 2) to form 3D information (3D reconstruction is performed; col. 1, lines 29-33; col. 4, lines 12-17).

Claim 47, Hartley teaches the third dimensional information includes a probability that the third dimensional information is correct (the true 3D point, see section 1.3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the matching points as taught by Hartley into the Ayache's method, because it would avoid the explicit computation of internal or external camera parameter model (section 1.3).

Claims 76 and 77, the rationale provided in the rejection of claim 44 is incorporated herein. In addition, Ayache teaches identifying points in each image, and identifying lines which pass through the points (col. 5, lines 33-54); using the information to form a disparity surface which represents 3D information corresponding to each point of the 2D points (col. 6, lines 35-39).

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7. Claims 48 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ayache et al. (6,175,648) in view of Hartley et al. "Stereo from Uncalibrated Cameras" and further in view of Szeliski et al. (6,018,349).

Claims 48 and 49, Ayache does not teach dividing the images into patches; however, Szeliski et al. teaches dividing the image into patches, finding the third dimensional information for each patch (col. 4, lines 15-34); determining third dimensional information for pixels on edges of the patches (col. 29, line 39 through col. 30, line 14). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a patch-based alignment method taught by Szeliski into the method of 3D reconstruction of Ayache, because it would compute local motion estimates between pairs of overlapping images, and using these estimates to warp each input image so as to reduce the misregistration (col. 3, lines 62-66).

8. Claims 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodfill et al. (6,456,737) in view of Hartley et al. "Stereo from Uncalibrated Cameras", and further in view of Sawhney et al. (6,571,024).

Claims 19-23, Woodfill does not teach Euclidean points; however, Sawhney et al. teaches converting the volume to Euclidean points (col. 5, lines 53-55); projecting a reconstruction of the volume, reconstructing Euclidean points from the projective reconstruction (col. 6, lines 25-36); transforming an origin of coordinate system to an origin of the images (image transformation; fig. 18, # 804); input a parameter (focal length; adjust the parameter (refining parameter; fig. 18, # 806) to approximate a proper Euclidean reconstruction (col. 5, lines 37-61). It would have been obvious to one of

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ordinary skill in the art at the time the invention was made to incorporate the Euclidean reconstructing as taught by Sawhney into the method for rectifying images of Woodfill for forming 3D image from 2D similar images, because it would provide a method of camera pose and scene geometric information for each frame of a video sequence (col. 2, lines 2-3).

9. Claims 14-16, 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodfill et al. (6,456,737) in view of Hartley et al. "Stereo from Uncalibrated Cameras", and further in view of VanEssen et al. (6,591,004).

Claims 14, 15, Woodfill does not teach tracing voxels; however, VanEssen et al. teaches tracing voxels in a multiresolution at coarsest level and a more detailed level (col. 25, lines 42-45; col. 26, lines 55-67); selecting the seed voxel using a winner take which has a maximum correlation value; identifying seed voxels which represent incorrect matches, removing the seeds after tracing (col. 19, lines 53-67). **Claim 16, 24**, Woodfill does not teach a seed voxel; however, VanEssen et al. teaches selecting a seed voxel by finding uniqueness (col. 44, line 65 through col. 45, line 23); dividing the surface into parts (segmented), the seed voxels are respectively for parts (col. 22, lines 28-36). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the tracing voxels and selecting voxels as taught by VanEssen into the method of Woodfill for forming 3D image from 2D similar images, because it would provide a method for reconstructing surfaces and analyzing surface volume representations of the shape of an object corresponding to image data, in which

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the object has been modeled as one or more physically distinct compartments (col. 2, lines 53-57).

10. Claims 17, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodfill et al. (6,456,737) in view of Hartley et al. "Stereo from Uncalibrated Cameras", and further in view of VanEssen et al. (6,591,004) and Szeliski et al. (5,917,937).

Claims 17 and 18, Woodfill does not teach using a winner take which has a maximum correlation value; however, Szeliski et al. teaches winning cell (col. 9, lines 40-45). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the seed voxel and winning cell as taught by Szeliski into the rectifying images of Woodfill's method for forming 3D images, because it would provide a stereo matching method simultaneously recovers disparities from input images to reconstruct 3D surface (abstract).

Allowable Subject Matter

11. Claims 29, 31-39, 55, 57-63 are allowed.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimbinh T. Nguyen whose telephone number is (571) 272-7644. The examiner can normally be reached on Monday to Thursday from 7:00 AM to 4:30 PM. The examiner can also be reached on alternate Friday from 7:00 AM to 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Razavi can be reached at (571) 272-7664. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

August 31, 2006



KIMBINH T. NGUYEN
PRIMARY EXAMINER